(No Model.) 2 Sheets—Sheet 1.

L. F. JORDAN.

ELECTRIC CAR LIGHTING.

No. 445,954. Patented Feb. 3, 1891.

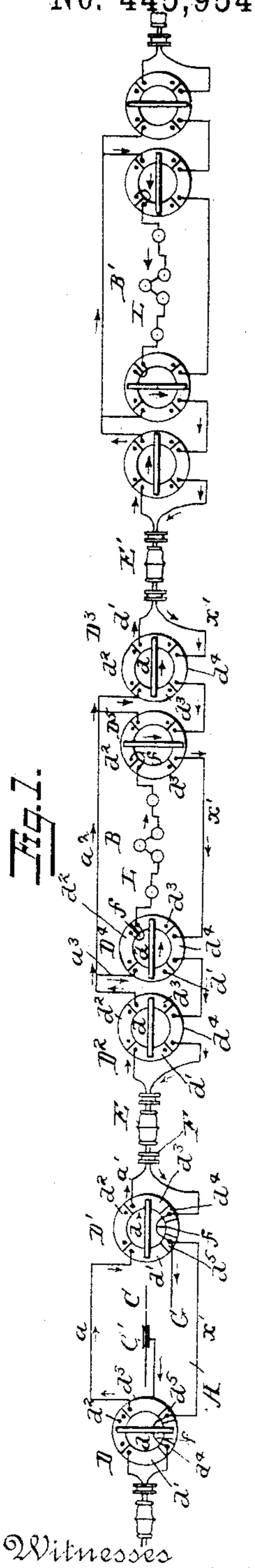

Fig. 1.

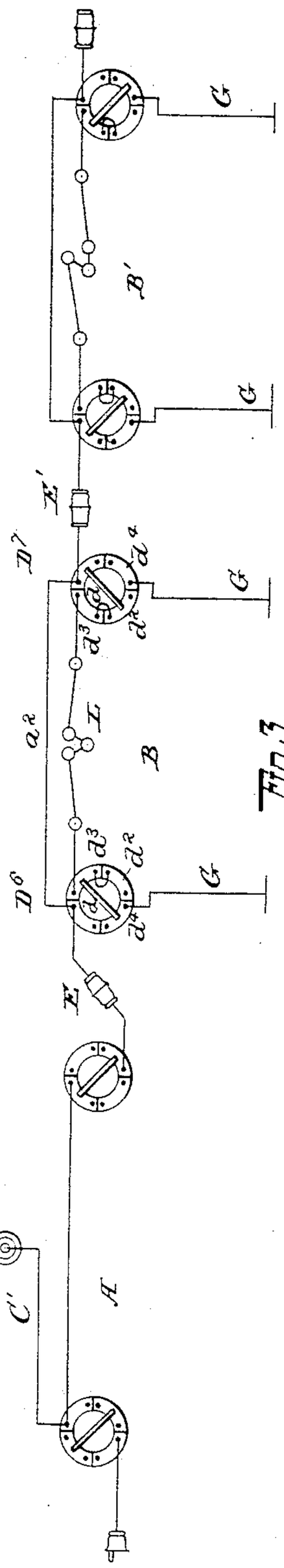

Fig. 2.

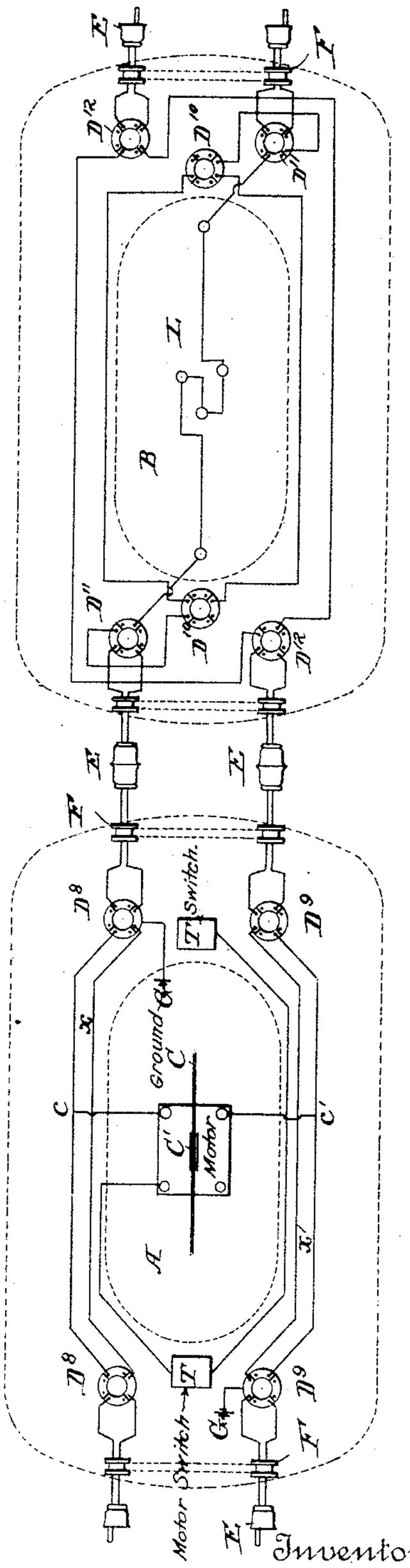

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

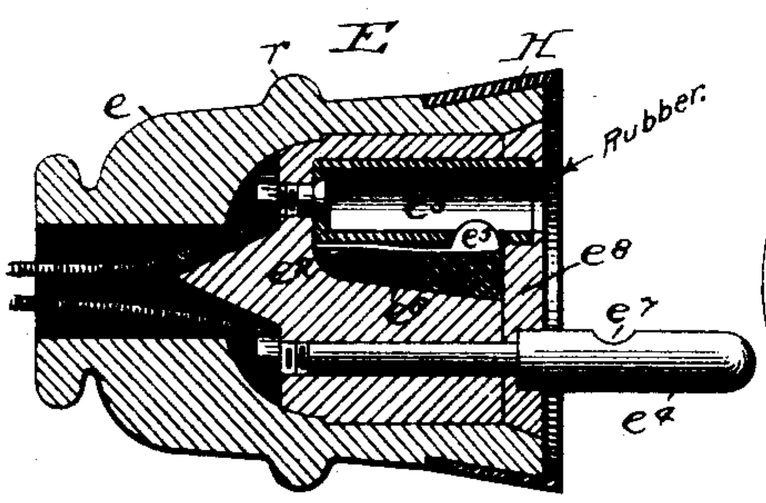


Fig. 5.

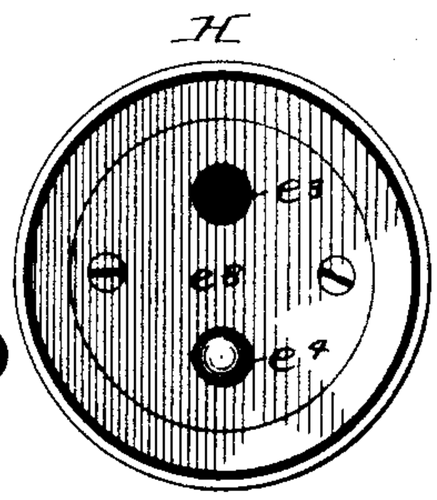


Fig. 6.

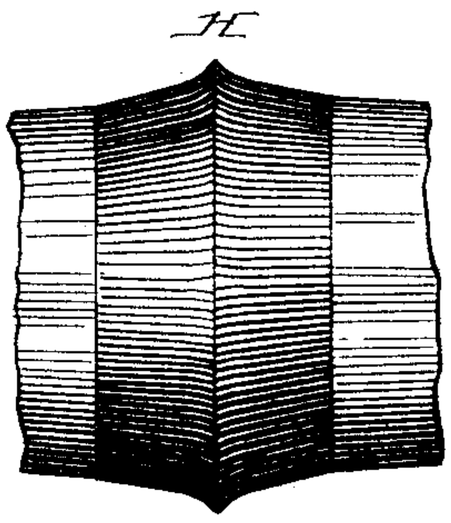


Fig. 7.

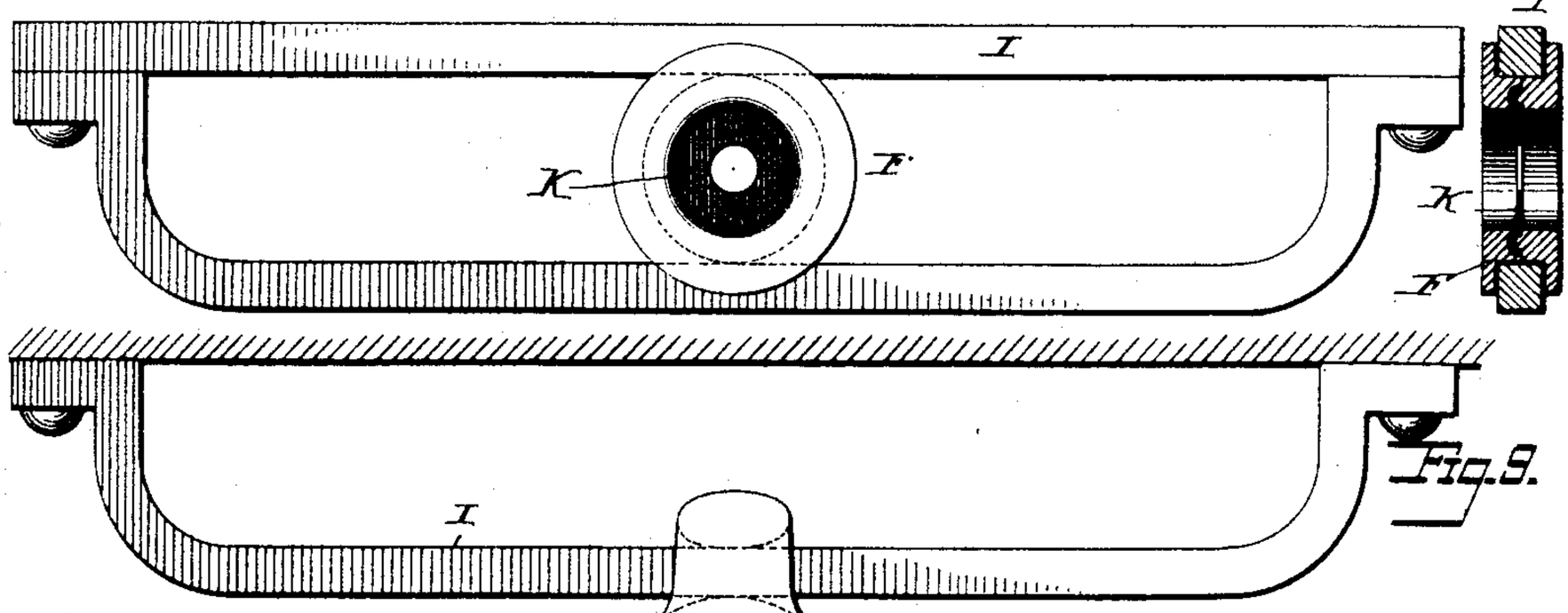


Fig. 8.

Fig. 9.

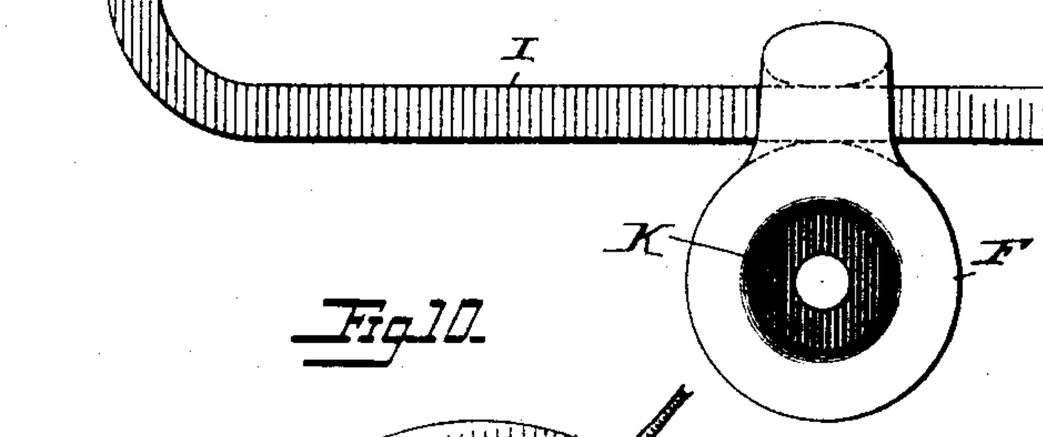


Fig. 10.

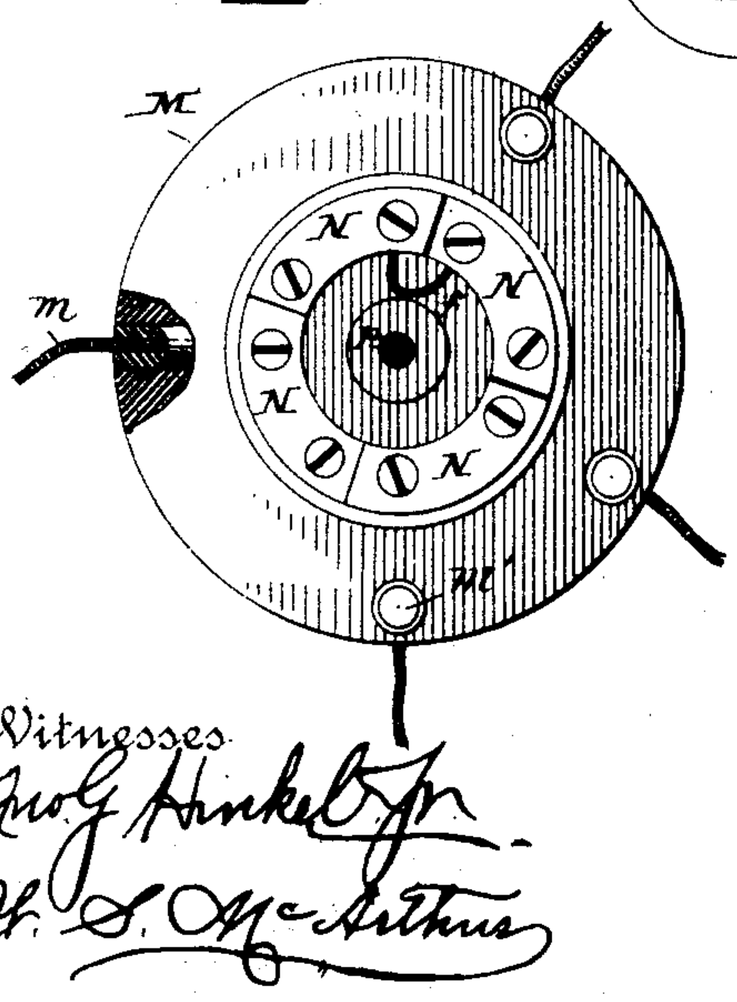
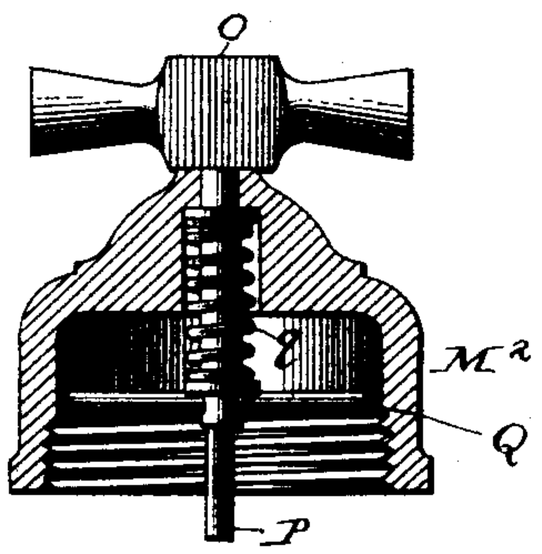
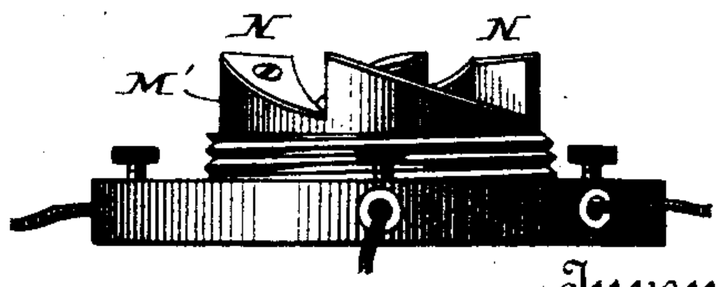


Fig. 11.





Witnesses.
Jno. J. Hinkel Jr.
Ch. S. McArthur

Inventor
L. F. Jordan
By his Attorneys
Foster & Freeman

UNITED STATES PATENT OFFICE.

LINWOOD F. JORDAN, OF SOMERVILLE, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE B. G. ELECTRICAL SUPPLY COMPANY, OF PORTLAND, MAINE.

ELECTRIC CAR-LIGHTING.

SPECIFICATION forming part of Letters Patent No. 445,954, dated February 3, 1891.

Application filed November 16, 1889. Serial No. 330,600. (No model.)

To all whom it may concern:

Be it known that I, LINWOOD F. JORDAN, a citizen of the United States, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Lighting Cars by Electricity, of which the following is a specification.

My invention relates to means for lighting cars electrically; and it has for its object to provide circuits and appliances whereby the cars may be lighted and connected in a train receiving the electricity from a motor-car or from a generator located on one of the cars, the object being to so arrange the circuits and appliances that any number of cars may be connected to form a train and that the electric current may be entirely confined and properly controlled by the trainmen, and at the same time there will be no danger to the passengers or the destruction of the apparatus under the ordinary conditions of travel.

To these ends my invention consists in the various arrangements, constructions, and combinations of parts hereinafter more fully pointed out.

Referring to the accompanying drawings, Figure 1 is a diagrammatic representation of a motor-car and two trailed cars, showing a preferred form of arranging the circuits and appliances. Fig. 2 is a similar diagrammatic view showing another arrangement of circuits. Fig. 3 is a diagrammatic view showing one system of wiring the motor and one of the trailed cars. Fig. 4 is a longitudinal section of one portion of the coupling device. Fig. 5 is an end view of the same. Fig. 6 is a side view showing the two parts of the coupler joined. Fig. 7 is a side view of the frame or guide, showing the diaphragm and holder. Fig. 8 is a vertical section thereof. Fig. 9 is a side view of a modified form. Fig. 10 is a plan view of the base of the switch device. Fig. 11 is a side view, partially in section, showing the parts of the switch detached.

In the accompanying drawings I have shown my invention applied to a street-car system propelled by electricity, as from an overhead conductor, through the medium of a trolley, although it is evident that my invention is not limited to such a system but can be applied by those skilled in the art, without departing from the principles set forth, to other and various systems of locomotion.

In the drawings, A represents what is known as the "motor-car."

B and B′ represent the trailed cars.

C is the conductor furnishing the electric current, which may be conveyed to the motor-car by any suitable means, as by the trolley C′, from which it is conducted to one of the switches and thence passes through the circuits, according to the way the switches are turned, and to the ground, as at G. I have not herein traced the circuits through the motor, which are the ordinary ones, but simply the branch circuits through which the current passes to energize the lights.

The motor-car is provided with two switches D D′, one at each end of the car. The trailed cars are also provided with switches arranged in duplicate at each end of the car, one, two, or three being used, according to the special arrangement of circuits.

The conductors between the cars are connected by a suitable coupling device E; and to prevent the wearing of the conductor as it swings between the cars I provide a support consisting of a frame containing a moving ring supporting a diaphragm of flexible material, through the center of which the conductor passes, and which allows the conductor to move longitudinally through the diaphragm, and also provides for lateral movement by the ring sliding or moving on the frame.

I will now describe more in detail the arrangement of circuits, referring especially to Fig. 1. The current, passing from the trolley C′ to the four-part switch D, goes by conductor *a* to the plate *d′* of the switch D′, thence by the cross-bar *d* to the plate d^3, and thence through the wire *a′* of the cable, through the diaphragm-guide F to one portion of the coupler E. If, for instance, the motor-car should be reversed, the bar *d* of the switch D would be turned ninety degrees, so as to connect the plates *d′* and d^3 to the coupler at that end of the car. The return-

circuit coming from the coupler E passes to the metal portion d^4 of the switch D′, thence through the safety-fuse f to the metal portion d^5, and to the ground at G. These portions d^5 of the switches D and D′ are connected by the conductor x, so that whichever end of the car is connected to the trailed cars the circuits are practically the same. It will be evident from this that it is only necessary to change the relations of the metal bars d in the two switches to direct the current from either end of the car through the cable connected to the trailed cars or to turn them properly to entirely cut off or break the circuit between the motor-car and the trailed cars.

The circuits in the trailed cars (which in this instance are precisely the same in all, and the connections are duplicated) may be described as follows: The incoming circuit from the coupler E is connected to the portion d' of the switch D^2 and the return-circuit to the portion d^4. The bar d being in the position shown in Fig. 1, the current passes through the plate d' to d^3 in the switch D^2, thence by the conductor a^2, which is provided with a branch a^3, leading to the switch D^4, and another branch at the other end of the car leading to the switch D^5, and thence to the plate d^3 of the switch D^3, and by the bar d of this switch to the plate d' and to the coupler E′, and so on throughout the train. The return-circuit x, coming from the coupler E′ is connected to the plate d^4 of the switch D^3, thence to the similar plates of the switches D^5, D^4, and D^2 to the other terminal or coupler at the other end of the car.

Between the switches D^4 and D^5 is arranged a circuit L, containing the lamps in series, and this circuit is connected to the plates d^3 of the switches D^4 and D^5, respectively, and a safety-fuse f is arranged between the plates d^2 and d^3 in each of these switches. Each car being provided with the circuits and switches set forth, the lamps therein can be lighted or extinguished from either end of the car, and the circuit, including the lamps in the rear cars, can also be controlled at either end of the car. To do this it is evident that by turning the bar d of the switch D^2 all the circuits in the rear of this switch are cut out, or by turning the same bar in the switch D^3 the circuits of any car following may be cut out. When, however, the switches D^2 and D^3 are arranged as shown, the following cars receive the current, and the lamps in this car can be lighted or extinguished from either end of the car by the switches D^4 D^5. In the car B the switch D^4 is shown in the position to connect the light-circuit L with the conductor a^2 at the forward end of the car, while the light-circuit is connected to the return-circuit x at the switch D^5, the current passing through one of the safety-fuses f, and this will be true whichever switch is arranged to close the circuit through the lamps. In car B′ the switches are arranged to take the current from the light-circuit in the opposite direction, the devices being the same in every respect except the position of the switch-bar.

In Fig. 2 I have shown another arrangement, which is practically the same, except that instead of having a return-circuit passing through the cars there is a separate ground at each car, and I am thereby enabled to dispense with one of the switches at each end of the trailed cars and accomplish practically the same results. The current from the motor-car passes through the coupler E to the switch D^6, and thence to the conductor a^2, to the switch D^7, and on through the coupler E′ to the next car. The light-circuit L is connected, as before, to the plates d^3 of the respective switches, and when the bars d are in the position shown in car B the lamps are energized, the current passing to the plate d^2, thence by the safety-fuse f to plate d^3 of switch D^7, thence through the circuit L to the plate d^3, bar d, plate d^4 of switch D^6 to the ground. In car B′ the arrangement is the same, except that the switches are shown in the opposite position, so that the current passes through the lamps in the opposite direction. It will thus be seen that in both arrangements of circuits shown in Figs. 1 and 2 the lamps are arranged in multiple-series circuit, and each circuit is completely under the control of parties on either end of each car.

In Fig. 3 practically the same circuits are shown, with the addition of another wire or circuit, by means of which the current can be passed through one car to the cars following without being in any way connected to the circuits of that car. This arrangement requires another switch at each end of the car. I have also shown in this figure one arrangement of circuits of the motor-car having at each end of the car two terminals, whereby it can be connected to the trailed cars going in either direction and the circuits may be completed therethrough. The current coming from the trolley C′ passes by wire c to both of the switches D^8, and x is the return-wire connecting these switches, the same as in Fig. 1, and G is the ground. On the opposite side of the car the wire c' connects the switches D^9, and the return and ground connections of these switches are precisely like that of the switches on the opposite side of the car. From each of the switches D^8 and D^9 extend the circuits to the couplers E. In this figure, T represents the switch in the ordinary motor-circuit, but which forms no part of my present invention.

In the trailed car in Fig. 3, D^{10} represents the switches controlling the light-circuit L at each end of the car. D^{11} are the switches controlling the main circuit in said car corresponding to the switches D^2 and D^3 in Fig. 1, and D^{12} are the switches controlling the main circuit of the cars following.

While different devices may be used in carrying out my invention and making the various connections set forth, I have illustrated

herein what I have found to be the most convenient and effective device for this purpose. The coupler E consists of two parts made precisely alike, having a body *e* of some non-conducting material, an internal plug e^2 fitted therein, in which is fitted a metallic socket e^3, having a terminal screw to connect one of the conductors thereto, and on the opposite side is arranged a plug e^4, connected by a screw to the other conductor. The socket e^3 has an opening in one side through which passes the lug or projection e^5, normally pressed forward by a spring e^6, preferably in the form of a block of elastic material. The plug e^4 is provided with a recess e^7, with which the projection e^5 engages to hold the two parts of the coupler together. Each body portion *e* of the coupler is provided with a ring *r*, projecting beyond its surface, which serves to aid in gripping the parts to couple or uncouple the same.

In order to prevent short-circuiting by accidental touch of the hand or otherwise, I fit in the end of the recessed body a cap e^8, which helps to support the plug e^4 and covers the socket e^3, it being recessed on the under side to receive the end and prevent the metal coming to the surface, and this cap also serves to retain the spring in position. This cap may be secured by screws or otherwise. In order to prevent moisture, dust, or other extraneous matter entering between the two parts of the coupler when they are joined, I provide on the adjacent ends of each part a gasket H, preferably in the form of a ring, fitting tightly the end of each portion of the coupler and normally projecting slightly beyond the same, so that when the two portions of the coupler are brought together the edges of the gaskets will abut and be forced outward, as shown in Fig. 6, and a tight joint is thus produced between the two parts.

To prevent the wearing of the conductor between the cars and allow free movement while turning curves and the like, I provide on each end of each car a frame I, in which I mount an annular roller or ring F, which is free to move from one side to the other of the frame, and between the two parts of the ring F, I secure a diaphragm K, of some elastic material, which will support the conductor and at the same time allow of longitudinal movement therethrough. In this way the conductor has entire freedom of movement without danger of wearing and destroying the insulation.

In Fig. 9 I have shown a slightly-different arrangement, in which the frame I supports the ring F, containing the diaphragm K, by a loop on its upper side. the opening through the loop, and through which the frame I passes, being preferably enlarged at its outer ends to allow the ring to swing or move freely therein.

The switch device which I prefer to use consists, essentially, of a base-piece M, having a number of terminals *m*, of metal, fitted therein and adapted to receive the ends of the conductors, which are secured therein by binding-screws *m'*. These terminals extend into the body of the switch and are connected to the plates N, respectively, which plates are mounted upon the outer surfaces of the toothed cylinder M', rising from the base M. Two of these plates N are connected by a safety-fuse *f*, adapted to carry the desired current used. Fitted around the cylinder M' is a cap M^2, supporting a handle O, mounted upon a pin P, which is adapted to extend into the opening *p* in the base of the switch. A cross-bar Q is secured to the pin P, and a spring *q*, surrounding the pin, tends to force the bar into contact with the plates N and at the same time allows the turning of the handle to cause the bar to pass over one pair of the plates N to another. In this way I am enabled to maintain good electrical contact between the cross-bar Q and the plates and at the same time to get quick snap break-and-make of the circuit to prevent the formation of any arc.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric-lighting system for cars, the combination, with the motor-circuit and switches controlling it, of an electric-lighting circuit consisting of a main conductor extending through the car and a returning or ground conductor, switches at each end of the car controlling the main conductor, conductors containing a series of lamps, and switches located at each end of the car controlling the circuit between said conductor and the main conductor, substantially as described.

2. In an electric-lighting system for cars, the combination, with the main conductor extending through the car, the return or ground conductor therefor, a switch at each end of the car controlling the circuits of the main conductor, a conductor including a series of lamps, and a four-point switch at each end of the car between said conductor and the main circuit, each switch being provided with a safety-fuse, substantially as described.

3. A coupler consisting of two like parts, each having a body of a non-conducting material and provided on its exterior surface midway between its ends with a projecting ring of non-conducting material, and each part provided on its ends with a gasket of flexible material extending beyond the end, whereby when the parts are brought together gaskets will bulge out and make a tight joint, substantially as described.

4. In an electric-lighting system for cars, a coupler consisting of two parts, each part having a metallic socket connected with one conductor, a projection entering a recess in said socket, a spring for maintaining said projection in place, and a plug having a recess corresponding to the projection and connected to the other conductor and adapted to fit the corresponding socket, substantially as described.

5. In an electric-lighting system for cars, a coupler consisting of two parts, the body of each of which is of insulating material, a metallic socket connected to one conductor, and a cap fitting the body and having a recess for the end of the socket, substantially as described.

6. In an electric-lighting system for cars, a frame supported at the end of the car and a diaphragm-ring supported by said frame and arranged to support and protect the conductor between the cars, substantially as described.

7. In an electric-lighting system for cars, the combination, with the circuits, of the four-part switch D, having sockets for the conductors fitted in the base of the switch, and plates connected with said sockets, two of the plates being connected with the main circuit, one of the plates being connected to the return-circuit and one of the plates being connected to the main-circuit plate by a fuse, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LINWOOD F. JORDAN.

Witnesses:
J. S. BARKER,
F. L. FREEMAN.